

NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Thread Cutting with 3-Axis N/C Milling Machine

The problem:

To cut threads, either in stock too big to mount on conventional machines, or in stock for which conventional methods are unsuitable. Special jigs for such threading jobs are usually required.

The solution:

TAPDIE, a generalized thread cutting macro written for the APT numerical control system. Given the description of the desired thread, TAPDIE computes the machine tool path necessary to cut the thread. This information is passed on within the APT computer system to a post-processor which produces a control tape for the milling machine.

By using a tool bit that will cut a triangular groove equivalent to the desired thread pitch, a three-axis milling machine may be used. Flats on the thread face may be controlled to the extent of the machine tool tolerance limits.

TAPDIE will cut almost any type thread. The thread diameter is limited only by the size of the tool bit. Inside or outside threads, either left or right handed may be specified. The threads may be either straight or tapered with any desired number of threads per inch and pitch per thread.

How it's done:

The APT part programmer supplies a simple description of the desired thread by using a FORTRAN type programming statement. The following calling sequence was used to produce inside threads: CALL/TAPDIE, MAJDIA = 2.75, LEAD = 4, TAPER = .166667, TYP = 1, TRAVEL = 2.125, TLDIA = 1., TOL = .001, FEED = .02, CUTFR = 25 where the variables in the calling sequence describe the thread, specify its type, and provide certain machine tool controlling information. MAJDIA gives the major diameter of the thread, LEAD is the number of threads per inch, TAPER is the tangent value

of the amount of taper to the thread, TYP indicates an inside thread, TRAVEL is the length of the thread, TLDIA is the diameter of the tool bit, TOL is the length of the allowed flat on the thread face, FEED is the amount of material to be removed from the stock at each pass, and CUTFR is the feed rate in inches per minute for cutting. Additional variables are available; ANGLE is the thread pitch angle, DIR indicates a right or left hand thread, BEG is the angular position for start of cut, ZC is the Z coordinate for the start of the thread, CLR is the part clearance distance, and POSNFR is the feedrate in inches per minute for moving the tool clear of the job. However, any variable which has a standard value, e.g., DIR may be omitted in the calling sequence. The variables may all be preset at the option of the programmer.

This macro is compatible with APT III Version 7 and is completely computer independent.

Notes:

1. An addendum to the APT encyclopedia, entitled TAPDIE, which contains detailed instructions for use of the macro, punched card decks containing the macro, and sample programs is available.
2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia 23365
Reference: B68-10055

Patent status:

No patent action is contemplated by NASA.
Source: George C. Salley and Charles H. Wood, Jr.
(LAR-10017)

Category 06